MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

PPS 0025 – INTRODUCTION TO PROBABILITY AND STATISTICS

(All sections / Groups)

18 OCTOBER 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of THREE **printed** pages excluding cover page.
2. Attempt **ALL** FOUR questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary working steps **MUST** be shown.
4. **Formula** is provided at the back of the question paper.
5. **Statistical table** is provided.

Question 1 (25 marks)

a. A census was conducted at a university. All Foundation in Management students were asked how many courses they were taking this semester. The maximum subjects that students can registered are 5 and the minimum are 1. The result shows that 15% of students in the population registered 1 subject, 10% registered 2 subjects, 45% of students registered 3 subjects, 12% of students registered 4 subjects and x% of students in the population registered 5 subjects.

i. Find the value of x. (1 marks)
ii. Prepare the probability distribution table to describe above situation. (3 marks)
iii. Compute the mean number of subjects register per term. (2 marks)
iv. Compute the standard deviation. (4 marks)

b. Suppose X has probability density function of

$$f(x)=\begin{cases} x & , \quad 0<x<1 \\ 2-x & , \quad 1\le x<2 \\ 0 & , \quad \text{otherwise} \end{cases}$$

i. Show that the function $f(x)$ is a valid probability function. (4 marks)
ii. Find $P(0.5 < X < 1.5)$. (4 marks)
iii. Calculate the standard deviation of $f(x)$. (7 marks)

Question 2 (25 marks)

a. In a survey conducted, 58% of workers said that employers have the right to monitor their smart phone use. Suppose that a random sample of 18 workers is selected, and they are asked if employers have the right to monitor smart phone use.

i. What is the probability that 5 or more of the workers agree? (3 marks)
ii. What is the probability that 4 to 12 of the workers agree? (3 marks)
iii. What is the probability that at least 10 of the workers **NOT** agree? (3 marks)
iv. What are the mean and standard deviation of the number of workers agree? (3 marks)

b. A computer center manager reports that his computer system experienced four component failures during the past 100 days.

i. What is the probability of no failures in a given day? (2 marks)

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ii. What is the probability of exactly 7 failures in a 55-day period? (3 marks)

c. The weight of new born baby is normally distributed with a mean of 3.75kg and a standard deviation of 0.33kg.

i. Find the probability that the weight of new born baby will be not less than 2.8kg. (2 marks)

ii. What is the weight of new born baby that would be in the middle 92% of the weight? (6 marks)

Question 3 (25 marks)

a. A marketing department of Company A consists of the following four administrative assistants. Each administrative assistants were asked to apply the same set of updates to a human resource database. Given the number of errors made by each of four administrative assistants as recorded by human resource department.

Administrative Assistant	Number of Errors
Anna	3
Brian	2
Christine	1
David	4

List all the possible samples of two administrative assistants (without replacement) from this population and construct the sampling distribution of the sample mean. (11 marks)

b. Time spent using email per session is normally distributed with $\mu = 8$ minutes and $\sigma = 2$ minutes. If you select a random sample of 25 sessions ,

i. find the probability that the sample mean is between 7.9 and 8.1 minutes. (4 marks)

ii. find the probability of the sample mean between 7.9 and 8.1 minutes given that a random sample of 49 sessions is selected. (4 marks)

iii. Explain the difference in the results of (i) and (ii). (2 marks)

iv. If you select a random sample of 25 sessions, there is 85% chance that the sample mean is less than how many minutes? (4 marks)

Continued...

Question 4 (25 marks)

a. A manufacturer of detergent claims that the contents of boxes sold weigh on average at least 16.5 ounces. The distribution of weight is known to be normal, with a standard deviation of 0.88 ounce. A random sample of 32 boxes yielded a sample mean weight of 15.94 ounces. Test at the 0.01% significance level that the manufacturer's claim is true. (8 marks)

b. Listed below are recorded speeds (in mi/h) of randomly selected cars traveling on a section of highway in a city. That part of the highway has a posted speed limit of 65mi/h. Assume that the variance of speeds is 36 mi/h and use a 0.01 significance level to test the claim that the sample is from a population with a mean that is different from 65 mi/h. (10 marks)

68	68	72	73	65	74	73	72	68	65
73	65	71	66	74	68	71	66	73	65
59	75	70	56	66	75	68	75	62	72
75	58	73	60	74	58	75	61	73	60

c. A simple random sample of 50 adults (including males and females) is obtained, and each person's red blood cell count (in cells per microliter) is measured. The sample mean is 4.63. The population standard deviation for red blood cell counts is 0.54.

i. Find the point estimate of the mean red blood cell count of adults. (1 mark)

ii. Construct a 92% confidence interval estimate of the mean red blood cell count of adults. (6 marks)

End of Page

Formula:

1.

	Mean	Variance
Discrete Random Variable X	$\mu = E(X)$ $= \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X)$ $= \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \frac{e^{-\lambda}\lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3. The z value for a value of x: $z = \frac{x - \mu}{\sigma}$

4. The z value for a value of $\bar{x}$: $z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

5. Point estimate of $\mu = \bar{x}$

Margin of error $= \pm 1.96\sigma_{\bar{x}} = \pm 1.96\frac{\sigma}{\sqrt{n}}$ or $= \pm 1.96 s_{\bar{x}} = \pm 1.96\frac{s}{\sqrt{n}}$

6. The $(1-\alpha)100\%$ confidence interval for μ is

$\bar{x} \pm z\sigma_{\bar{x}}$ if σ is known

$\bar{x} \pm z s_{\bar{x}}$ if σ is not known

where $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \frac{s}{\sqrt{n}}$